

Definition

The normal vaginal discharge is white, nonhomogeneous, and viscous. It contains vaginal squamous epithelial cells in a serous transudate, as well as material from sebaceous, sweat, and Bartholin's glands, and secretions from the cervix. A small number of polymorphonuclear leukocytes may be seen, probably coming from the cervix. The pH is below 4.5, usually between 3.8 and 4.2. The predominant organisms are lactobacilli, large gram-positive rods.

The quantity of normal discharge varies from woman to woman and increases during ovulation, premenstrually, and during pregnancy. A normal discharge does not have an offensive odor and is not associated with vaginal irritation, itching, or burning.

Technique

A variety of tests and cultures can be done on secretions obtained at the time of pelvic examination. None is more important than the microscopic examination. Using a Q-tip, obtain some secretions from the posterior fornix. To prepare a *wet prep*, use one of the two following methods.

- Place the sample in 1 ml of saline and agitate to mix. Take a drop of this mixture and place it on a slide.
- Place a drop of saline on a slide and add a small amount of the discharge.

In either case, cover with a cover slip. The first method is preferred if the discharge is profuse, as it will dilute the secretions so that individual cells can be seen better.

The slide may be warmed briefly (to increase motility of trichomonas) and should be looked at promptly. A careful search of several fields should be made at both medium and high power for trichomonas, clue cells, and yeast. Trichomonas are motile flagellated organisms about the size of a white blood cell (WBC). They are best recognized by their characteristic twisting motion. Clue cells are vaginal epithelial cells with adherent coccobacilli. Yeast may be seen as budding or hyphal forms, and may be seen best with the addition of potassium hydroxide.

Lastly, the presence or absence of a large number of leukocytes should be noted. A few may be normal, but more than 10 per high-power field is abnormal.

An additional swab should be taken and some discharge placed on a slide. Add a drop of 10% *potassium hydroxide* (KOH) and cover with a cover slip. Heat the slide just until bubbles form under the cover slip, but no longer. This aids in lysis of the cells, but leaves fungi. The slide should then be examined carefully for the presence of budding yeast or hyphae.

The *pH* of the vaginal secretions can be obtained by placing a sample from the lateral wall of the vagina on pH

paper. The paper should include a range of pH from 4.0 to above 5.0. The normal pH is 4.5 or less.

The *whiff test* is a test for the fishy odor that occurs in bacterial vaginosis (previously called Gardnerella vaginitis and nonspecific vaginitis). A drop of KOH is mixed with some vaginal discharge. A positive test is abnormal and consists of a characteristic fishy odor.

Gram stain of the vaginal discharge can be done using standard methods. Yeast will be detectable, and the predominant bacterial flora may be assessed (e.g., normal gram-positive bacilli or abnormal gram-negative coccobacilli and rods). Clue cells can be identified accurately.

Gram stain of the endocervical mucous may be helpful in the evaluation of cervicitis. If gram-negative diplococci are seen *inside* cells, this is diagnostic for Neisseria gonorrhea. This is a relatively insensitive test, however, and should not substitute for a culture. An excess of leukocytes (more than 10/hpf) in the endocervical mucous suggests chlamydial cervicitis, and appropriate studies should be obtained.

In addition to information about cervical cytology, the *Papanicolaou (Pap) smear* will often add information regarding possible vaginal and cervical pathogens. For example, trichomonas or yeast may be seen. Certain cytologic changes may suggest chlamydial cervicitis. Endocervical and ectocervical Pap smears should be obtained as described in Chapter 179.

Cultures should never substitute for a careful history, physical examination, and microscopic examination of the wet prep. Depending on the results of a vaginal culture without microscopic examination of the secretions will result in frequent errors in treatment. Nevertheless, cervical cultures may be especially helpful in some cases.

Yeast will grow on routine culture as well as on specific media. Trichomonas may be cultured, but this is not available in most laboratories. Cervical cultures for *N. gonorrhea* are done by placing a sterile swab into the endocervical canal. Ideally, this should be plated on a specific medium immediately, as delay decreases the yield sharply. Chlamydia cultures are expensive and require a week for results. Recently immunofluorescence techniques have become available. These are less expensive and results are available sooner.

Basic Science

Pathologic vaginal discharges are caused by a variety of infectious and noninfectious causes. The discharge may be caused by infections of the vagina itself, but infections or inflammation of the cervix also lead to an increase in vaginal discharge. In many patients, more than one cause is present.

A careful history and physical may help to separate these two conditions and point to an etiology. On pelvic examination, careful attention should be paid to the presence or absence of cervical inflammation, usually manifest as edema

or friability, and to the presence or absence of cervical mucus, that is, mucopurulent secretions in the endocervical canal. Cervical inflammation or mucus suggest cervicitis, but cervical infections such as *N. gonorrhea* and *C. trachomatis* can be present without them and should be sought in appropriate patients.

The three major causes of vaginitis are *Trichomonas*, *Candida*, and bacterial vaginosis. These can be distinguished by appropriate laboratory tests.

Trichomonas Vaginalis

Trichomonas vaginalis is a protozoan parasite. It grows best in moderately anaerobic conditions when the pH is 5.6 to 6.5. It can be seen in asymptomatic women, but when symptomatic, it causes a white to yellow discharge that may be frothy. The classic findings of vaginal petechiae are relatively uncommon. An odor may be present. The pH is usually high (greater than 5.0), and the discharge often contains numerous WBCs. In florid cases the wet prep reveals numerous motile organisms, but in milder cases a careful search through many fields must be made to see one or two motile organisms. Wet prep is not 100% sensitive. Culture-positive patients have been found to be wet-prep positive in as few as 50 to 60% of cases. Although cultures are more accurate, they are not available in most laboratories. Therefore, trichomonas cannot be ruled out in patients with a negative wet prep. Pap smears may also reveal trichomonas. A discharge with a large number of white blood cells in a patient who does not have cervicitis suggests trichomonas.

Candida

Candida vaginitis may elicit no vaginal discharge, merely causing vulvar and/or vaginal erythema. If a discharge is present, it is usually thick, white, so-called cottage cheese. The pH is normal. There is no abnormal odor, and the whiff test is negative.

Wet prep reveals normal epithelial cells. There may be a small increase in the number of WBCs. The bacteria are

the normal lactobacilli. Wet prep may reveal yeast, as budding forms or pseudohyphae. Potassium hydroxide is somewhat more sensitive, but its sensitivity varies, being as low as 20% in some series of culture-positive patients. Therefore, treatment must often be based on clinical suspicion alone.

Candida may be grown on a variety of media. Cultures are more accurate than microscopic examination alone, but the significance of a positive culture in an asymptomatic patient is unknown, so cultures should be done only to confirm suspected cases.

Nonspecific or Bacterial Vaginosis

This form of vaginitis is possibly the most common. A diagnosis is made if three of the following four criteria are present: adherent and homogeneous discharge; positive whiff test; clue cells; or pH greater than 4.5. The positive whiff test is caused by aromatization of aromatic amines in the presence of KOH. Gram stain will reveal gram-negative coccobacilli adherent to epithelial cells. If WBCs are present in large numbers, coexisting trichomonas or cervicitis should be suspected, as bacterial vaginosis does not elicit an inflammatory response.

One can culture for *Gardnerella vaginalis* (i.e., the organism felt to be at least partly responsible for this disease), but a positive culture is not diagnostic as *Gardnerella* may be present in small numbers in normal women, so the diagnosis rests on the above combination of findings.

Cervicitis

Cervicitis may cause a purulent discharge from the cervix. The discharge will not have an odor and will consist of sheets of white blood cells; the vaginal pH is variable. Gram stain may reveal gram-negative intracellular diplococci if *N. gonorrhea* is the cause. Appropriate tests for gonorrhea and tests for chlamydia must be done, but treatment should not be delayed because ascending infection may occur. Table 179.1 summarizes the laboratory data.

Table 179.1
Laboratory Evaluation of Vaginal Discharge

	Normal	<i>Trichomonas</i>	Bacterial vaginosis	<i>Candida</i>	Cervicitis
pH	<4.5	>4.5	>4.5	<4.5	Variable, usually >4.5
Abnormal odor (positive whiff test)	No	Yes	Yes	No	No
Wet prep					
Epithelial cells	Normal	Normal	Clue cells	Normal	Normal
Leukocytes	Occasional	May be increased	Occasional	Occasional to slightly increased	Increased
Organisms	Large rods not adherent to cells	Mobile flagellated organisms	Coccobacilli adherent to cells	Budding yeast or hyphae	Variable
Potassium hydroxide	Negative	Negative	Negative	Budding yeast or hyphae	Negative
Gram stain	Gram-positive rods	<i>Trichomonas</i> (flagellated organisms)	Gram-negative coccobacilli	Budding yeast or hyphae	Gram-negative intracellular diplococci ^a

^aIf *Neisseria gonorrhoeae*.

Clinical Significance

Vaginitis and cervicitis are extremely common conditions and are responsible for many office visits and much discomfort to patients. Cervicitis may lead to serious ascending infections and subsequent tubal infertility. Because of this, accurate and prompt diagnosis is mandatory. There is no excuse for trying to diagnose the cause of a vaginal discharge without the use of laboratory tests. The most important is the wet prep, which allows the clinician to distinguish between the three common causes of vaginitis. Cervicitis may be suspected because of findings on physical examination or if there are numerous WBCs on microscopic examination, especially if these cannot be explained by a trichomonas infection.

In certain cases, screening cultures for gonorrhea and tests for chlamydia should be done. These cases might include women who have other sexually transmitted diseases, such as trichomonas; women with multiple sexual partners; and perhaps other groups. Cultures are mandatory in women with mucopurulent cervicitis.

Treatment for the cause of a vaginal discharge should be based on what the clinician feels is the likely pathogen after completion of the history, physical examination, and examination of the discharge. Correct therapy and a successful outcome depend on the accuracy of the diagnosis.

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